

City Farm SLO – Walk-In Produce Coolbot Cooler

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Abstract

This paper describes the planning, financing, and construction of a commercial sized refrigerator for a non-profit urban farm in San Luis Obispo, CA, called City Farm SLO. Construction of the project occurred over a nine-month period from September of 2020 to May of 2021. The project involved building a Tuffshed, site grading, framing a room inside the Tuffshed, hanging a door, installing electricity inside the room, insulating the interior, painting the exterior, installing an air conditioner, and wiring the Coolbot to the air conditioner. The project was built to allow the non-profit organization to begin storing their agricultural crops in a cooled storage space that will put them in a position to begin selling their products to local retailers. This paper will focus on the planning, construction, and lessons learned from this project.

Key Words: Construction, Coolbot, Cooler, Tuffshed, Agriculture

Background

This project is for City Farm SLO in San Luis Obispo, CA. The farm is a non-profit urban agricultural farm that was established in 2014. The farm manages land for sustainable agricultural production, provides youth with on-site educational programs, and engages the community in the life of an urban farm. The project is intended to provide the farm with a space to store their agricultural crops for an extended period of time and will allow them to begin selling their products to local retailers.

In the Spring of 2020, City Farm SLO and I coordinated on a plan to build a project that would be of use to the farm. Originally, the project was planned to be a gazebo structure with a wind block that would be built in the farm's educational program area. After planning for this project for a few weeks, the farm inquired about building a different project that would be of more use to the farm. During the middle of July, the farm director asked me if I could build a commercial sized cooler/refrigerator instead of building the originally planned gazebo. At the time the farm asked me to change the scope of the project, I did not have the knowledge on how to properly build a cooler for an agricultural farm. I agreed to take on the challenge and we continued with the cooler project. The director suggested that I research a product known as a Coolbot. From research, I found that a Coolbot is a product manufactured by the Store It Cold company. This product works with a standard window air conditioner and allows the air conditioner to cool a small room as low as 32 degrees Fahrenheit. Research on Store It Cold's website shows that the Coolbot product has been very successful in helping farmers, florists, hunters, brewers, restaurants, convenience stores, mortuaries, and others build coolers. The farm director and I found that this would be the most economical way to provide the farm with a functionable cooler, while also making the project constructable enough to be built prior to my academic graduation. An employee for City Farm SLO had knowledge that another farm in San Luis Obispo called SLO Veg was using a Coolbot device to power their cooler. A representative from SLO Veg agreed to meet with the City Farm SLO director and I to allow us to inspect their cooler. The Coolbot device and cooler at SLO Veg was functioning as intended and gave the two of us the confidence to move forward with the project.

The fundraising for the project was generated by the City Farm SLO staff. The farm director, Steven Weiss, was able to gather funding for the project from several close friends and from some donors that had previously donated to the farm.

Construction

The farm decided that they wanted the cooler to be built inside of a Tuffshed. By using a pre-manufactured Tuffshed, the project can avoid the permitting process with the City of San Luis Obispo. The location for the cooler is right next to an existing electrical panel in order to avoid high costs associated with running electricity long distances. The location for the cooler is also in a position that makes it visible to drivers on the 101-Freeway. Decompressed gravel was brought in and leveled out to act as the base for the building. After the decompressed gravel was leveled, the Tuffshed was delivered. Construction of the Tuffshed was difficult because it did not come with any instructions, so I had to use my knowledge of construction and communicate with the manufacturer.

The floor joists and rim joists for the base of the Tuffshed are made of cold formed steel. The floor joists were fastened to the rim joists with sheet metal screws. After this, the floorboards were installed over the metal joists to complete the floor system. The Tuffshed

came with four premanufactured walls and these were all lifted into place over the floor system. The walls were fastened to each other and the bottom plates were fastened to the floor with long sheet metal screws every 16" O.C. After all of the walls were in place, I installed the trusses that came premanufactured with the Tuffshed. These trusses were spaced 2' from each other and fastened to the top plate. After all of the trusses were put into place, I realized that the trusses were not at the elevation that they needed to be to install the roof sheathing. I quickly realized that this was because I forgot to install the double top plate on top of the two 12' walls. The trusses were then removed, so the double top plates could be installed, and the trusses could then be put in at the correct elevation. Once the trusses were installed, the roof sheathing was placed on top of the trusses. The necessary trim was then put in around the building. The cracks in the roof sheathing were covered with ZIP system tape to provide an extra layer of moisture protection. This step was proceeded with installing the vapor barrier provided by the Tuffshed manufacturer. Flashing was installed all around the roof after the vapor barrier was laid completely across the roofs surface. The roof shingles were then installed along with the building's vents. Trim was attached to the Tuffshed door and the door was screwed into place. The entire shed was painted with two coats of red paint along the walls and two coats of white paint along the trim. This officially completed the construction of the Tuffshed assembly.

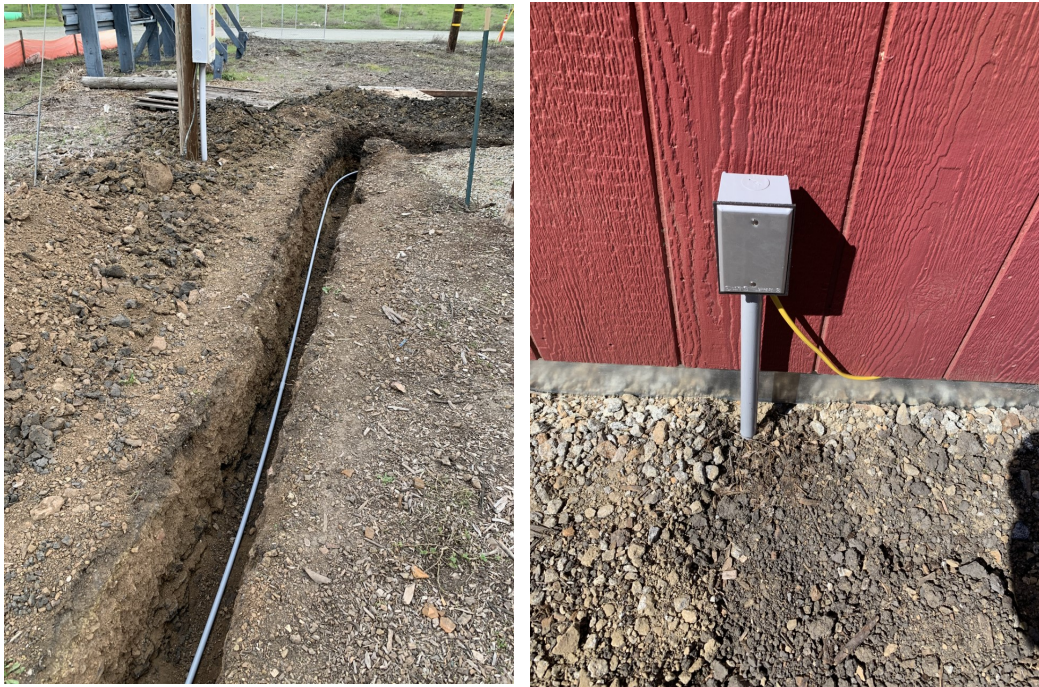


Once the Tuffshed was assembled, I began construction work on the interior to continue building out the cooler. The dimensions for the Tuffshed were too large for a window air conditioner to be able drop the temperature of the room down to 34 degrees Fahrenheit, the proper refrigerating temperature for produce. Because of this, a small room inside of the Tuffshed would have to be built out that would act as the cooler's space and allow the window air conditioner to drop the temperature of the room down to 34 degrees Fahrenheit. I designed a wall that would sit 4' inside of the Tuffshed entrance door and make the cooler have a dimension size of 8'x10'. The rest of the space inside of the cooler would be used as storage. I built out this wall inside of the Tuffshed and then tied in some ceiling joists between the interior wall and the back Tuffshed wall.



The next step involved utilizing an electrician. The window air conditioner and the Coolbot device both required a 110 Volt outlet power source. I am not licensed in this field, so I am not permitted to do this work. I hand dug a trench with a pick and shovel from the nearby electrical panel to where the electrician would tie into the building. I had to hand dig the trench because there were many underground utilities of which the locations were unknown in the area. Unfortunately, I broke one of the underground electrical PVC pipes with a pick and the electrician had to repair it. The electrician that originally was planned to do the work had to back out of the project due to a large demand of work at the time. The director of the

farm and I were able to find another electrician to do the work within a reasonable amount of time. The electrician roughed in the location for a duplex outlet, a light fixture, and a light switch inside the cooler.



The remaining work involved in finishing the cooler included insulation, framing, installing the air conditioner, installing the Coolbot device, and the electrical finish work. I insulated the floor with two layers of rigid insulation with an R-value of 13.1. The cooler required at least a minimum R-value of 25 in order for the room to reach the desired temperature. The floor was topped with a $\frac{3}{4}$ " piece of plywood. A window was then framed for the air conditioner and the air conditioner was installed. The remaining insulation was placed around the room with two layers of rigid insulation surrounding the entire room. Gaps between the insulation panels were filled with spray foam insulation and then covered with HVAC tape. The electrician then returned to finish wiring the interior. Once this work was completed, I installed the Coolbot device. The last two steps involved placing sheathing over the interior wall in order to hide the insulation and make the interior more aesthetic as well as installing trim around the air conditioner.



Final Deliverables

The project was started in September of 2020. I worked on this project on various days each week that I had the time available. The project was officially completed on May 19, 2021. The farm director was regularly provided schedule updates on when the various tasks associated with the project would be completed along with expense reports for the material bought for the project. June 9th of 2021 featured the grand opening of City Farm SLO's Walk-in Produce Cooler. The event took place at the farm with a pop-up stand where the farm sold vegetables grown onsite, including cucumbers, peas, onions, carrots, garlic, broccoli, lettuce, chard, and kale.

Lessons Learned

Self-building this project was one of the hardest things that I have ever had to do. I took on this project with very little knowledge about how to complete the project. My only prior trade experience related to construction involved concrete and grading work. I learned many different skills involved in the trades of framing, insulation, roofing, HVAC, sheet metal,

painting, electrical, and finish carpentry. As the Cal Poly motto states the best way to learn something is to “Learn By Doing.”

I also learned about the importance of planning and coordination. This project involved coordinating with the farm, material suppliers, my senior project advisor, the city of San Luis Obispo, and the electrical subcontractor. Unfortunately, the original electrical subcontractor pulled out of this project, but it taught me about something that is very common in the construction industry. Many subcontractors often pull out of work in the construction industry due to a lack of manpower and due to overcommitting to jobs. This stresses the importance of building quality relationships with subcontractors, choosing reputable subcontractors, and having a plan if one of the subcontractors falls through.

This project also taught me the importance of having a good team when building any construction project. Though I self-built the majority of this project, I could not have completed this project without the help of many individuals. The farm director, Steven Marx, a farm employee, Shane Lovell, and my senior project advisor, Andrew Kline, all were important people involved in the completion of this project.

Another important lesson from this project is the importance of perseverance. There were many days that I did not think that the project would get completed, but I continued to push forward. I struggled to complete many of the tasks efficiently, but eventually was able to complete the project and learned about the importance of persistence.





